THE

ONTARIO WATER RESOURCES

COMMISSION

WATER POLLUTION SURVEY

of the

TOWN OF NAPANEE

COUNTY OF LENNOX & ADDINGTON

1968

R E P O R T

on a

WATER POLLUTION SURVEY

of the

TOWN OF NAPANEE

in the

COUNTY OF LENNOX AND ADDINGTON

1 9 6 8

DISTRICT ENGINEERS BRANCH

DIVISION OF SANITARY ENGINEERING

WATER POLLUTION SURVEY

of the

T O W N O F N A P A N E E

INDEX — PAGE NO.

ONTARIO WATER RESOURCES COMMISSION

R E P O R T

INTRODUCTION

A water pollution survey of the Town of Napanee was performed in November, 1967. Surveys of this type are made by the Ontario Water Resources Commission for the purpose of locating and recording sources of existing and potential water pollution. Samples were collected from outfalls to the Napanee River as well as pertinent river locations. Recommendations pertaining to the abatement of these sources of pollution are made to the parties concerned.

It is noted that the comments in this report pertain to conditions as they existed at the time of the survey.

PREVIOUS SURVEYS

Previous surveys of the Napanee River which included the Town of Napanee were performed in 1961 and 1964. Flows of an unsatisfactory sanitary quality were discharging to the river from municipal storm sewers. Recommendations were made to exclude these wastes as well as improve methods of refuse disposal and to provide chlorination to the Napanee sewage treatment plant effluent.

INTERVIEWS WITH OFFICIALS

Valuable assistance was received from the following officials during this survey:

Mr. M. C. Graham, Clerk-Treasurer

Mr. W. J. C. Clark, Sewage Treatment Plant Operator

Mr. T. Powell, Works Superintendent

Dr. W. N. Turpel, Medical Officer of Health and Director, Lennox & Addington Health Unit.

TOWN OF NAPANEE

The Town of Napanee is located on Highway No. 2 on the shores of the Napanee River approximately six miles upstream from the Bay of Quinte. The 1968 Municipal Directory indicates that the population of the town is 4,694. The municipality is approximately 1,480 acres in size and is built on fissured limestone bedrock which prevails in this general area.

The appendices to this report include an interpretation of the various tests performed on the samples, a summary of methods of financing water and sewage works programmes, a tabulation of the sample results and a map of the town showing the sampling point locations.

A planning consultant has been retained by the Town of Napanee to prepare an official plan for the Town. A section has been appended to this report on effective community planning through an official plan.

WATER USES

Municipal

Water from a canal connected to the Napanee River is delivered by gravity to the purification plant. The design capacity of the treatment plant is approximately 2.5 million gallons per day with a present consumption of approximately 850,000 gallons per day. The treatment consists of settling, coagulation, filtration and chlorination. Alum, carbon, lime, chlorine and sodium chlorite are added in this treatment.

Industrial

All major industries are supplied by the municipal water supply.

Private

Approximately twelve residences in the town obtain water from private well supplies.

SURFACE WATER DRAINAGE

Municipal storm sewers and drainage ditches are utilized in part of the town to direct water flows to the Napanee River. A large part of the town is served by combined sewers. Previous investigations revealed that inadequately treated wastes were reaching the river via the storm sewer system. Observations, as well as samples collected during this survey, indicate that sanitary wastes continue to gain access to the municipal storm sewers.

WASTE DISPOSAL

Municipal Sewage Works

The town is served by a system of sanitary and combined sewers on the north-west side of the Napanee River. Septic tank systems and privies serve the residences on the south-east side of the river. There are three pumping stations, the locations of which are shown on the appended map of the Town of Napanee. The Napier Street sewage pumping station has an emergency discharge to the Napanee River which is used during periods of heavy surface run-off. During this investigation there was no sewage by-passing at this pumping station.

The municipal sewage treatment plant is located on the west side of the Napanee River at Hessford and Water

Streets. This primary treatment plant provides screening, sedimentation, sludge digestion, sludge drying and effluent chlorination. The plant outfall is submerged in the Napanee River approximately 300 feet off shore. The treatment plant has a design capacity of 750,000 gallons per day. For the period from October 1966 to September 1967, the average daily flow was 802,000 gallons per day. This hydraulic load was 7% over the design flow. At times the maximum daily flow was almost twice the design flow.

The samples of the sewage treatment plant effluent collected at the time of this survey contained a high BOD and suspended solids concentration. With this high stream loading, a noticeable effect on the downstream river quality was evident from the river samples. On other occasions, effluent samples revealed high phenol concentrations and a high number of coliform organisms.

In order to treat the present hydraulic flow and in order to serve any further development within the municipality, expansion is required. Secondary treatment should be provided. With this increased type of treatment, more efficient BOD and suspended solids removal would reduce the stream loading and the degrading effect on the Napanee River.

Oil and grease which has been gaining access to the sewers, has caused operational problems at the treatment plant. As a result, the town council in May 1968 adopted an industrial waste by-law to control discharge to sanitary sewers. This by-law should be enforced to enable more effective treatment at the plant.

J. D. Lee Engineering Ltd., has been retained by the town to review and report on the need for expansion of the town's sewage treatment facilities. Since some sanitary wastes were entering the storm sewers, the terms of reference for the consulting engineer should include a programme for the removal of all sanitary sewage from storm sewers.

Disposal Sites

The town utilizes two disposal sites, one for refuse and one for garbage. The refuse disposal site is used for inorganic wastes and the dump for organic wastes.

The refuse disposal site is located on the west bank of the Napanee River just north of the sewage treatment plant between Napier Street and Hessford Street. For several years, refuse has been placed in this area, resulting in considerable land being reclaimed from the watercourse. The last survey revealed that seepage and an

accumulation of debris and refuse from the disposal site was gaining access to the river. At the time of this inspection, the refuse was being placed on top of a previous placed layer, back from the shoreline of the river. This disposal site slopes toward the river and during periods of high surface runoff, polluted water could easily gain entry to the river. The possibility of seepage to the river is also great due to its proximity.

The acquisition of another site where the refuse could not affect a watercourse is desirable.

The garbage from the town is hauled to a dump owned and operated by Mr. Sutcliff, east of the Town of Napanee in the Township of Richmond. The garbage is burned and the residue is covered with earth material. It is reported to be remote from watercourses.

SAMPLING PROCEDURE

The locations of sampling points are shown on the appended map of the Town of Napanee. Samples were collected from all outfalls where significant flows were observed. River samples were collected at pertinent points in order to access the influence of the waste flows on the receiving watercourse.

Laboratory analyses were performed at the Ontario Water Resources Commission Laboratory in Toronto and the Ontario Department of Health Regional Laboratory in Kingston.

SAMPLE RESULTS

Similar conditions to those noted in previous surveys are apparent from the results of samples collected during this survey. The results indicate degradation in the quality of the Napanee River water as it flows through the town. Several factors are contributing to this condition. The Robinson Street and Centre Street municipal storm sewers contain sanitary wastes as revealed by samples taken of their outfall discharge to the Napanee River. Samples collected opposite the Napanee refuse disposal site had excessive BOD and coliform counts. This was likely due to seepage from the fill area. The effluent from the hydraulically overloaded sewage treatment plant was of high strength and showed an adverse effect on the river quality downstream from the outfall.

SUMMARY

A water pollution survey of the Town of Napanee was performed in November, 1967. This survey revealed unsatisfactory conditions similar to those indicated in previous

surveys. The following recommendations are made for the abatement of water pollution.

RECOMMENDATIONS

1. The present primary treatment plant requires expansion for the present hydraulic overload. A secondary treatment plant should be constructed to provide better treatment and to adequately accomodate future growth.

2. The refuse disposal site should be relocated to a site remote from watercourses.

3. In regard to the sewage report being prepared for the town, its terms of reference should include a programme for the removal of all sanitary sewage from storm sewers.

/cb

Prepared By: L. E. Murray

L. E. Murray,
Civil Technologist,
Division of Sanitary Engineering.

TABLE I

APPENDIX

Significance of Laboratory Analyses

Bacteriological Examination

The presence of coliforms indicates pollution from human or animal excrement, or from some non-faecal forms. The objective for surface water quality in Ontario is a maximum of 2400 organisms per 100 millilitres.

The OWRC Laboratories employ the Membrane Filter (MF) technique of examination to obtain a direct enumeration of coliform organisms. The Department of Health Laboratories use the Most Probable Number (MPN) enumeration and coliform counts are reported as Total Coliform Organisms (TC) and Faecal Coliform Organisms (FC).

Sanitary Chemical Analyses

Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is reported in parts per million (ppm) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The completion of the laboratory test required five days, under the controlled incubation temperature of 20° Centigrade.

The OWRC objective for surface water quality is an upper limit of four (4) ppm.

Solids

The value for solids, expressed in parts per million (ppm) is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality.

The effects of suspended solids in water are reflected in difficulties associated with water purification, depositions in streams and injury to the habitat of fish. Where suspended solids values are less than 20 ppm, laboratory difficulties are experienced and the turbidity is determined instead.

Turbidity

Turbidity is caused by the presence of suspended matter, such as clay, silt, finely divided organic matter, plankton and other microscopic organisms in water. It is an expression of the optical property of a sample and the results are reported in "turbidity units".

Physical Determinations

Dissolved Oxygen

The amount of dissolved oxygen contained in unpolluted water fluctuates with the temperature. A deficiency of oxygen in water is replaced by oxygen from the

atmosphere. There is a saturation value for each temperature. At 18° C this is 9.54 ppm of dissolved oxygen. Values below the saturation level indicate the presence of pollution organic substances which are absorbing oxygen from the water. The extent of this deficiency is one index of the degree of organic pollution. Substantial reduction in dissolved oxygen causes suffocation of fish.

Temperature

The temperature of water influences the solubility of oxygen and the rate of oxidation and purification.

TABLE II

APPENDIX

Nitrogen

Ammonia Nitrogen (Free Ammonia) is the soluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically. Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water.

The following values may be of general significance in appraising free ammonia content: Low 0.015 to 0.03; moderate 0.03 to 0.10 ppm; high 0.10 or greater.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl less the Ammonia and organic nitrogen determinations are important in determing the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Nitrite Nitrogen

Nitrite is usually an intermediate oxidation product of ammonia. The significance of nitrites, therefore, varies with their amount, source and relation to other constituents of the sample, notably the relative magnitude of ammonia and nitrate present. Since nitrite is rapidly and

easily converted to nitrate, its presence in concentrations greater than a few thousandths of a part per million is generally indicative of active biological processes in the water.

Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

The following ranges in concentration may be used as a guide. Low, less than 0.1 ppm; moderate, 0.1 to 1.0 ppm; high, greater than 1.0 ppm.

Phosphorus

Total Phosphorus

Total phosphorus is a measure of both the organic and inorganic forms of phosphorus present.

Soluble Phosphorus is a measure of the orthophosphate only and when subtracted from the total phosphorus gives an indication of the concentration of organic phosphorus present. That is, the soluble phosphorus is a measure in the form of polyphosphate, which, however, in surface waters is

usually insignificant. Inorganic phosphorus in concentration in excess of 0.01 ppm may cause nuisance conditions.

Anionic Detergents (ABS)

The presence of anionic detergents as ABS is an indication that domestic waste is present.

Phenols

The presence of phenol or phenolic equivalents is generally associated with discharges containing petroleum products, or with wastes from some industries. It is generally conceded that adequate protection of surface waters will be provided if the concentration of phenols in waste discharges does not exceed 20 parts per billion (ppb). Phenolic type waste can cause objectionable conditions in water supplies and might taint the flesh of fish.

APPENDIX

IMPLEMENTATION OF WATER AND SEWAGE WORKS PROGRAMS

Currently, there are three general methods which may be utilized for implementing sewage and water works programs. These are: 1) to enter into an agreement with the OWRC for the construction of the treatment and collector works with an obligation to pay the debt retirement and operating charges over the term of the agreement with the facility reverting to the municipality at the end of the term of the agreement, 2) by requesting the provision of service from a Provincially-owned project, and 3) by proceeding with the construction independently and meeting capital costs by the sale of debentures.

OWRC/MUNICIPAL PROJECTS

For the construction of water and sewage works under agreement with this Commission, the works are provided and developed under Sections 39 to 46 of the Ontario Water Resources Commission Act.

For this type of arrangement, the Commission utilizes a sinking fund and consequently the annual payments are based on a specific debt retirement period and the payments are unchanged for the period of the agreement. This type of project may be financed over a period of time up to a maximum of thirty years. The annual charges for projects constructed under this agreement are determined as follows:

1. Capital Repayment

   As noted, OWRC financing is by the sinking fund method and an annual payment of approximately 2 per cent of the capital

cost is required to retire a debt over a thirty-year period.

2. Interest

On new Commission projects, interest is calculated at the current rate.

3. Reserve Fund

To provide money for repairs and replacements, Section 40 of The Ontario Water Resources Commission Act provides for the establishment of a reserve fund by the Commission. It is important to note that this fund is established in the name of the municipality and the balance consequently earns interest. It has now been established by Commission minute that the reserve fund billing for each project shall continue only until the fund reaches an amount of ten times the initial annual billing and the reserve fund billing shall be re-imposed only when the fund has been depleted to 80 per cent or less of the maximum amount.

4. Operating Costs

Under OWRC agreement, the municipality is responsible only for the operating costs directly attributed to the project in the municipality. Therefore, no charges are made by the Commission for the services of head office personnel who are available as required to advise on the satisfactory operation and maintenance of the project.

PROVINCIALLY-OWNED WORKS

In June, 1967, the Honourable J. R. Simonett, Minister of Energy and Resources Management, made an announcement which expanded the authorization of this Commission for the provision of water supply and sewage treatment facilities. This new program allows the Commission to construct entire water and sewage works facilities for small municipalities. The capital costs of these can be amortized over a 40 year period.

A slight variation of this program could be implemented in that the municipality may request that this Commission provide only the major water and sewage works facilities as Provincially-owned works, and develop the water distribution and sewage collector systems under the standard type of Commission project. It would appear that where applicable, it would be more advantageous for the municipality to proceed on the basis of requesting this Commission to develop entire systems as Provincially-owned works.

The associated cost of supplying these works, including amortization of capital costs, together with operating and maintenance charges, will be recovered by the sale of service to the affected municipalities by rates determined on a usage basis. These facilities will be wholly-owned by the Province of Ontario and the arrangements for service will be formalized by contracts between the Commission and the municipality concerned. The installations will be operated entirely at cost with appropriate provision for adjustment in rate.

DEVELOPMENT

If a municipality, after considering the alternatives, wishes this Commission to consider Provincially-financed projects, application forms should be completed and submitted together with a resolution of the Municipal council. A draft of the suggested wording of the resolution is included with the application forms.

If the proposed works are to be built by the municipality on its own initiative or as a formal project under agreement with this Commission, it is required that the Council retain a consulting engineer to prepare preliminary engineering reports on the proposed work. If a Provincial system is contemplated, no action should be taken with respect to retaining a consulting engineering firm as the Commission will designate a consulting engineer to carry out the Provincial portion of the work and it would be advantageous if the municipal portion be studied and reported on by the same engineer.

APPENDIX

COMMUNITY PLANNING

The need for effective planning has become more important today then ever before. Municipalities are being burdened with the rising costs of land and labour. Therefore, any project a community hopes to develop should be based on sound planning. Planning at all levels of government is essential but, community planning can be most effective if interest and initiative is generated at the local level. The enormous benefits accrued as a result of good planning can more than compensate for the initial investment.

Community planning can be described as an effort to control and direct development effectively. This can best be achieved through the development of an official plan. An official plan is the stated intention of the local authorities with respect to orderly development within the planning area, that is prepared and set forth with professional assistance and meets the requirements as set out by the Provincial Planning Act. An official plan can be a joint effort by a number of municipalities which have common basic characteristics and common problems, or one municipality can establish a plan on its own initiative.

Orderly development yields future economy in services. Development in the community can be retarded where an official plan does not exist. A plan provides, among other things, the framework for the rational design of water and sewage works and also the extensions of mains and collector sewer systems.

A local council having decided to proceed with a programme of community planning definitely should contact the Ontario Department of Municipal Affairs. Through its many branches, information and guidance is provided to all interested parties.

TOWN OF NAPANEE

WATER POLLUTION SURVEY

SAMPLING POINT NUMBER	DATE 1967	DESCRIPTION OF SAMPLING POINTS	5-DAY BOD	SOLIDS			BACTERIOLOGICAL EXAMINATIONS			PHOSPHORUS AS PO		NITROGEN AS N			
				TOTAL	SUSP.	DISS.	COLIFORMS PER 100 ML	MOST PROBABLE NUMBER TOT.COLI.	E. COLI	TOT.	SOL.	FREE AMM.	TOTAL KJELDAHL	NITRITE	NITRATE
N.5.1	Nov.10	NAPANEE RIVER-1500' DOWNSTREAM FROM TOWN LIMITS	3.9	161	4	157	8,500			3.5		2.0	12.0	0.01	0.00
N.5.3	Nov.9	NAPANEE RIVER-500' DOWNSTREAM FROM STP OUTFALL	3.7	170	5	165	1,100			1.0	0.9	1.0	3.30	0.02	0.00
N.5.4T	Nov.9	NAPANEE STP OUTFALL	54	480	30	450	4			10	6.3	1.0	15.0	0.04	0.50
N.5.42	Nov.9	NAPANEE RIVER-100' UPSTREAM FROM STP OUTFALL	3.1	165	4	161	640			0.30	0.10	1.1	9.90	0.01	0.00
N.5.45	Nov.9	NAPANEE RIVER-100' FROM SHORE OPPOSITE NAPANEE REFUSE DISPOSAL SITE	4.8	218	5	213	14,600			0.38	0.2	7.8	8.30	0.02	0.00
N.5.46	Nov.9	NAPANEE RIVER-10' FROM SHORE OPPOSITE NAPANEE REFUSE DISPOSAL SITE	11.	242	10	232	40			1.5	1.1	1.6	22.0	0.03	0.00
N.5.5R	Nov.9	RELIEF OUTFALL FROM NAPIER ST. SEWAGE PUMPING STATION		N O			F L O W								
N.5.73	Nov.9	NAPANEE RIVER-100' DOWNSTREAM FROM ROBINSON STREET DITCH	2.9	176	7	169	220			0.50	0.10	1.3	5.00	0.01	0.00
N.5.78	Nov.9	NAPANEE RIVER IN COVE AT END OF ROBINSON STREET DITCH	2.7	166	9	157	584			0.60	0.12	1.4	8.30	0.01	0.00
N.5.8 D	Nov.3	STORM SEWER OUTFALL TO DITCH AT THE FOOT OF ROBINSON STREET	1.1	390	9	381		22,000	3,100						
	Nov.9		1.7	422	7	415	8,800			2.8	1.0	1.0	5.00	0.02	0.75

.....CONTINUED

TOWN OF NAPANEE

WATER POLLUTION SURVEY

SAMPLING POINT NUMBER	DATE	DESCRIPTION OF SAMPLING POINTS	5-DAY BOD	SOLIDS TOTAL	SOLIDS SUSP.	SOLIDS DISS.	BACTERIOLOGICAL EXAMINATIONS COLIFORMS PER 100 ML	MOST PROBABLE NUMBER TOTAL COLI.	MOST PROBABLE NUMBER E COLI.	PHOSPHORUS AS PO TOT.	PHOSPHORUS AS PO SOL.	NITROGEN AS N FREE AMM.	NITROGEN AS N TOTAL KJELDAHL	NITRITE	NITRATE
N.5.85	Nov.9	NAPANEE RIVER-100' UPSTREAM FROM ROBINSON STREET OUTFALL	2.8	155	3	153	232			0.40	0.10	1.6	3.30	0.01	0.00
N.5.98	Nov.9	NAPANEE RIVER-100' DOWNSTREAM FROM CENTRE STREET OUTFALL	2.8	156	5	151	340			0.40	0.10	1.7	3.30	0.01	0.00
N.6.0	Nov.3	NAPANEE RIVER-UNDER CENTRE STREET BRIDGE	2.0	218	4	214		4,000	380						
N.6.0 W-1	Nov.3	STORM SEWER WHICH DISCHARGES TO NAPANEE RIVER AT THE FOOT OF CENTRE STREET	12	422	7	415		80,000	30						
	Nov.9		4.5	280	13	267	2600,000			2.5	2.4	1.0	1.70	0.03	0.00
N.6.0 W-2	Nov.9	SUBMERGED STORM SEWERS WHICH DISCHARGES ON SOUTH SIDE OF NAPANEE RIVER	N O F L O W												
N.6.02	Nov.9	NAPANEE RIVER-100' UPSTREAM FROM CENTRE STREET OUTFALLS	2.3	152	4	148	176			0.53	0.10	2.1	9.90	0.01	0.00
N.6.1W	Nov.9	STORM SEWER WHICH DISCHARGES TO NAPANEE RIVER AT THE FOOT OF EAST STREET	N O F L O W												
N.6.1	Nov.9	NAPANEE RIVER-BESIDE MUNICIPAL WATER WORKS	2.9	155	3	152	172			0.60	0.5	1.9	6.60	0.02	0.00
N.6.3W	Nov.9	STORM SEWER OUTFALL JUST BELOW C.N.R. BRIDGE	N O F L O W												

.....CONTINUED

TOWN OF NAPANEE

WATER POLLUTION SURVEY

SAMPLING POINT NUMBER	DATE	DESCRIPTION OF SAMPLING POINTS	5-DAY BOD	SOLIDS TOTAL	SOLIDS SUSP.	SOLIDS DISS.	BACTERIOLOGICAL EXAMINATIONS COLIFORMS PER 100 ML	BACTERIOLOGICAL EXAMINATIONS MOST PROBABLE NUMBER TOTAL COLI.	BACTERIOLOGICAL EXAMINATIONS MOST PROBABLE NUMBER E. COLI.	PHOSPHORUS AS PO TOT.	PHOSPHORUS AS PO SOL.	NITROGEN AS N FREE AMMON.	NITROGEN AS N TOTAL KJELDAHL	NITROGEN AS N NITRITE	NITROGEN AS N NITRATE
N.6.4	Nov.3	NAPANEE RIVER AT BRIDGE ON ROAD TO NEWBURGH	1.1	246	2	244		2500	420						
N.6.4	Nov.9		1.8	160	5	155	176			1.20	0.1	1.0	8.30	0.02	0.00
N.6.65D	Nov.3	DRAINAGE DITCH TO RIVER FROM DAIRY AVENUE	3.0	474	19	455		5600	1400						
	Nov.9		1.3	488	4	484	168			1.20	0.1	1.2	12.0	0.01	0.10
N.6.9D	Nov.3	DRAINAGE DITCH TO RIVER	1.1	364	1	363		2600	250						
	Nov.9		1.2	386	4	382	92			0.3	0.10	2.4	6.60	0.01	0.10
N.7.0	Nov.10	NAPANEE RIVER UPSTREAM LIMITS OF THE TOWN	2.9	154	8	146	104			0.60		2.1	3.30	0.02	0.00

ALL ANALYSES IN PPM UNLESS OTHERWISE INDICATED.

TOWNSHIP OF RICHMOND

ROAD ALLOWANCE BETWEEN CONS. II & III

SMITH FALLS DIV.

NEWBURGH RD.

CAMDEN

CENTRE

CHURCH ST.

QUEEN ST.

KING ST.

DAIRY AVE

ACME FARMERS DAIRY

FISHER ST

FIRST ST

HWY NO. 41

C.N.R.

BAY OF QUINTE RWY

BELLEVILLE RD

MARILYN AVE

SEWAGE PUMPING STA.

ELIZABETH ST

ANN ST

ISABELLA ST

GRAHAM ST

THOMAS ST

ROBERT ST

CENTRE ST

JOHN ST

EAST ST

ADELPH ST

ALMA AVE

WEST ST

NAPANEE ST

SIMCOE ST

HEAD ST

BROOK ST

REAR ST

MAIN ST

WILLIAM ST

HWY NO 2

SIMCOE ST. EXT.

YORK ST

SIMCOE ST

UNION ST

BRIDGE ST

DONALD ST

RICHARD ST

ROBINSON ST

DUNDAS ST

MILL ST

WATER ST

NAPIER ST

ENGLAND ST

HESSFORD ST

FRONT ST

MUNICIPAL WATER WORKS

MUNICIPAL S.T.P.

SEWAGE P.S.

REFUSE DISPOSAL SITE

VICTORIA ST

PEARL ST

HENRY ST

RIVER

NAPANEE

N. 7.0

N. 6.9 D

N. 6.65 D

N. 6.4

N. 6.3 W

N. 6.1

N. 6.1 W

N. 6.02

N. 5.98

N. 6.0 W-1

N. 6.0 W-2

N. 6.0

N. 5.8 D

N. 5.5 R

N. 5.4 T

N. 5.85

N. 5.78

N. 5.73

N. 5.1

N. 5.46

N. 5.42

N. 5.45

N. 5.3

NORTH FREDERICKSBURGH TWP.

LEGEND:

N. 5.5 – STREAM SAMPLING POINTS SHOWING STREAM AND MILEAGE

N. 6.0 D – OUTLET SAMPLE SHOWING MILEAGE AND TYPE

TOWN LIMITS

TYPE OF OUTLET

W – WATER (STORM SEWER)

D – DITCH

T – SEWAGE TREATMENT PLANT

R – RELIEF SEWER

ONTARIO WATER RESOURCES COMMISSION

TOWN OF NAPANEE

WATER POLLUTION SURVEY

1968

SCALE 250' 0 250' 500' 1000'

DRAWN BY: J. H | DATE: MARCH, 1961 REV. 1964

CHECKED BY: | DRAWING NO: 61 - 20 A